Notes - Writing Equations of Quadratics

1) Given the vertex and another point on the graph.

→ Plug the vertex into h and k

→ Plug the point into x and y (or f(x)).

→ Solve for a

Ex: Write the equation of the quadratic function with a vertex of $(-3, 5)$ and a y-intercept of -13.

h, k $\quad$ $(0, -13)$ → x, y

$$f(x) = a(x-h)^2 + k \Rightarrow -13 = a(0--3)^2 + 5$$

$$-13 = a(3)^2 + 5$$

$$-13 = 9a + 5$$

$$-5 \qquad -5$$

$$\frac{-18}{9} = \frac{9a}{9} \qquad a = -2$$

$$\boxed{f(x) = -2(x+3)^2 + 5}$$

2) Given the x-intercepts / roots / zeros / solutions

→ Make factors using the opposite of the root

→ Note - you can only solve for a if they give you a third point

Ex: Find the eq. of a parabola that opens down and has the x-intercepts $(-2, 0)$ and $(5, 0)$.

$$f(x) = -(x+2)(x-5)$$

↑ need the negative in front to make it open down

Ex 2: x-intercepts $(-1, 0)$ and $(3, 0)$ and y-intercept $(0, -6)$

$$f(x) = a(x+1)(x-3)$$

$$- = a(0+1)(0-3)$$

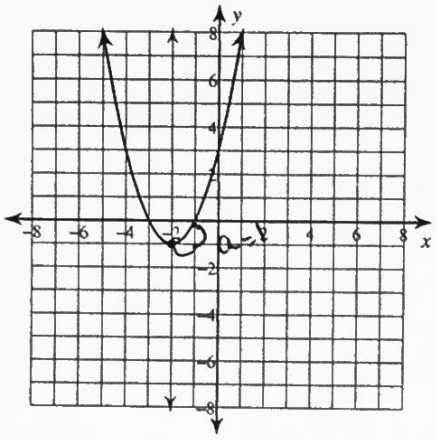
$$-6 = -3a \qquad a = 2$$

$$\Rightarrow f(x) = 2(x+1)(x-3)$$

3) Given a graph

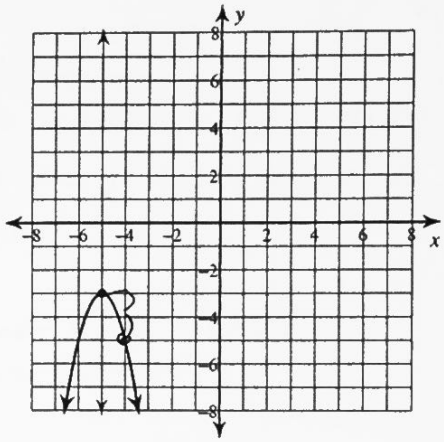
→ Find the vertex and plug it into h, k

→ Go over 1 unit to the left or right of the vertex then go up or down until you hit the parabola. The number of units you moved up or down is your a.



vertex = (-2, -1)
over 1 up 1 ⇒ a = 1

$f(x) = (x+2)^2 - 1$



vertex = (-5, -3)
over 1 down 2 ⇒ a = -2

$f(x) = -2(x+5)^2 - 3$